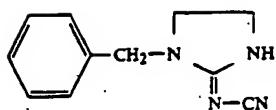
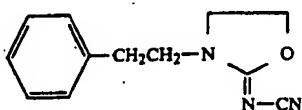


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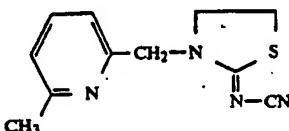
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(described in Japanese Laid-Open Patent Publication No. 91064)



(described in the above-cited patent document)



(described in Japanese Laid-Open Patent Publication No. 196877/1984)

#### EXAMPLE 6 (biological test)

Test on organophosphate-resistant green rice leafhoppers (*Nephrotettix cincticeps*)

##### Preparation of a test chemical

Solvent: 3 parts by weight of xylene

Emulsifier: 1 part by weight of polyoxyethylene alkylphenyl ether

To prepare a preparation of a suitable active compound, 1 part by weight of the active compound was mixed with the above amount of the solvent containing the above amount of the emulsifier, and the mixture was diluted with water to a predetermined concentration.

##### Testing method

A water dilution of each of the active compounds in a predetermined concentration prepared as above was sprayed onto rice plants, about 10 cm [all] tall, grown in pots having a diameter of 12 cm at a rate of 10 ml per pot. The sprayed chemical was dried, and a wire net having a diameter of 7 cm and a height of 14 cm was put over each of the pots, and 30 female imagoes of rice leafhopper of a strain having resistance to organophosphate chemicals were released into the net. The pots were placed in a constant-temperature chamber. Two days later, the number of dead insects was examined, and the kill ratio was calculated.

Compared with comparison compounds W-1, W-2 and Q2 for example the following compounds according to the invention exhibited a considerably better [efficiency] efficacy: Compound Nos. 4, 5, 8, 9, 25, 27, 54, 65, 67, 69, 79.

#### EXAMPLE 7 (biological test)

Test on planthoppers

##### Testing method

A water dilution of each of the active compounds in a predetermined concentration prepared as in the preceding example was sprayed onto rice plants, 10 cm tall, grown in pots having a diameter of 12 cm at a rate of 10 ml per pot. The sprayed chemical was dried, and a wire net having a diameter of 7 cm and a height of 14 cm was put over each of the pots, and 30 female imagoes of

w-1 brown planthopper (*Nilaparvata lugens*) of a strain having resistance to organophosphate chemicals were released into the net and the pots were placed in a constant temperature chamber. Two days later, the number of dead insects was examined, and the kill ratio was calculated.

w-2 In the same way as above, the kill ratio on white-backed planthopper (*Sogatella furcifera*) and organophosphate-resistant smaller brown planthopper (*Laodelphax striatellus*) was calculated.

Compared with comparison compounds W-1, W-2 and Q-1 for example the following compounds according to the invention exhibited a considerably better efficacy against brown planthoppers, brown smaller planthoppers and white-backed planthoppers: Compounds No. 4, 5, 8, 9, 25, 27, 65, 67.

#### EXAMPLE 8 (biological test)

20 Test on green peach aphids (*Myzus persicae*) having resistance to organophosphate and carbamate chemicals

##### Testing method

25 Bred green peach aphids having resistance to organophosphates and carbamates were inoculated on eggplant (black elongate variety) seedlings, about 20 cm tall, grown in unglazed pots having a diameter of 15 cm at a rate of about 200 per seedling. One day after the inoculation, a water dilution of each of the active compounds in a predetermined concentration prepared as in Example 6 was sprayed in sufficient amounts by means of a spray gun. After the spraying, the pots were left to stand in a greenhouse kept at 28° C. Twenty-four hours after the spraying, the kill ratio was calculated. The above test was carried out through two replicates.

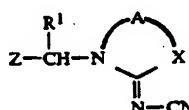
30 Compared with comparison compounds W-1, W-2 and Q-2 for example the following compounds according to the invention exhibited a considerably better efficacy against *Myzus persicae*: Compounds No. 4, 5, 25, 27, 65, 67, 69.

35 The biological tests shown in Examples 6, 7 and 8 are only typical examples of the insecticidal use of the compounds of this invention. The compounds of this invention shown herein are typical examples, and the utility of the invention is not to be limited to these examples alone.

40 It will be understood that the specification and examples are illustrative but not limitative of the present invention and that other embodiments within the spirit and scope of the invention will suggest themselves to those skilled in the art.

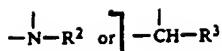
##### We claim:

55 1. A heterocyclic compound of the formula



wherein

R<sup>1</sup> represents a hydrogen atom or a methyl group,  
A represents an ethylene group which may be substituted by methyl,  
X represents an oxygen or sulfur atom or the group



in which [R<sup>2</sup> represents a hydrogen atom, a C<sub>1</sub>-C<sub>4</sub> alkyl group which may be substituted by a substituent selected from halogens, C<sub>1</sub>-C<sub>4</sub> alkoxy groups, C<sub>1</sub>-C<sub>4</sub> alkylthio groups and cyano, a C<sub>2</sub>-C<sub>4</sub> alkenyl group, a C<sub>2</sub>-C<sub>4</sub> alkynyl group, a pyridylmethyl group which may be substituted by halogen and/or methyl, a benzyl group which may be substituted by halogen and/or methyl, a formyl group, an alkylcarbonyl group having 1 to 2 carbon atoms in the alkyl moiety which may be substituted by halogen, a phenylcarbonyl group which may be substituted by halogen and/or methyl, an alkoxy or alkylthiocarbonyl group having 1 to 4 carbon atoms in the alkyl moiety, a phenoxy carbonyl group, a C<sub>1</sub>-C<sub>4</sub> alkylsulfonyl group which may be substituted by halogen or a phenylsulfonyl group which may be substituted by methyl.]

R<sup>3</sup> represents a hydrogen atom or a C<sub>1</sub>-C<sub>7</sub> alkyl group, and

Z represents a 3-pyridyl group or a 4-pyridyl group optionally substituted by at least one substituent selected from halogen atoms, alkyl groups having 1 to 4 carbon atoms, alkoxy groups having 1 to 4 carbon atoms, alkylthio groups having 1 to 4 carbon atoms, haloalkyl groups having 1 to 4 carbon atoms, haloalkoxy groups having 1 to 4 carbon atoms, alkylsulfonyl groups having 1 to 4 carbon atoms, a cyano group and a nitro group.

[2. A compound according to claim 1, wherein

R<sup>1</sup> represents a hydrogen atom,

A represents an ethylene group,

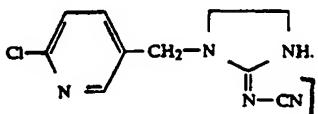
X represents a sulfur atom or the group



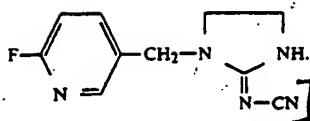
and

Z represents a 3-pyridyl group or a 4-pyridyl [gr] group optionally substituted by at least one substituent selected from a [fluorine] fluorine atom, a chlorine atom, a bromine atom, a methyl group, a methoxy group, a methylthio group, a trifluoromethyl group, a trifluoromethoxy group, a methylsulfonyl group, a cyano group and a nitro group.]

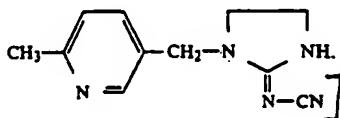
[3. A compound according to claim 1, wherein such compound is 1-(2-chloro-5-pyridylmethyl)-2-cyanoiminoimidazolidine of the formula



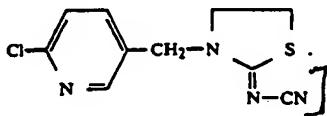
[4. A compound according to claim 1, wherein such compound is 1-(2-fluoro-5-pyridylmethyl)-2-cyanoiminoimidazolidine of the formula



5 [5. A compound according to claim 1, wherein such compound is 1-(2-methyl-5-pyridylmethyl)-2-cyanoiminoimidazolidine of the formula



10 [6. A compound according to claim 1, wherein such compound is 1-(2-chloro-5-pyridylmethyl)-2-cyanoiminothiazolidine of the formula



15 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 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